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COMBATING THE "SHOCK DOCTRINE" TO REPAIR HISTORICAL HYDRAULIC STRUCTURES

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SUMMARY

Hydraulic sites, like river weirs, dams, locks and flood barriers contain structures of relatively long service lives. However, also these structures can suffer substantial damages. The question that arises then is whether to repair the structure or replace it by one that better suits modern technology.

Legitimate as it is, this question is often subjected to pressures that are not supported by analyses, let alone the care for technological heritage. Instead, they reflect commercial or other particular interests. They also benefit from the emotions after the damage that demand radical solutions. The strategies applied resemble the so-called "shock doctrine", the term introduced by Naomi Klein in her book of the same title.

This paper presents some experiences with this phenomenon, collected from the failures of hydraulic steel structures in the Netherlands and occasionally in other countries. It provides a short analysis of the pressures that engineers experience, followed by some practical notions on how to handle them.

Keywords: *Structural Engineering, Hydraulic Engineering, Rehabilitation, Old Technology, Hydraulic Gate, Heritage, Shock Doctrine.*

1. IDENTIFYING GATE STRUCTURAL FAILURES

Failures of hydraulic structures are of various nature and various consequences. Also the popular definitions of structural failure allow for various interpretations whether an upset event can be classified as a failure – and if so then whether it was the structure that actually failed. Without going into this discussion, two groups of structural failures can be distinguished for further consideration:

a) 'Conventional' structural failure, directly resulting from the excess of design load (usually hydraulic load) over the strength or stiffness limits of the structure.
b) 'Operational' structural failure, resulting from inadequate operation, utilization, maintenance, power supply, and/or other unsatisfied or unforeseen operation conditions.

One may notice that there is some similarity between these groups of failures and, respectively, the ultimate limit state (ULS) and serviceability limit state (SLS), but there are also differences. Moreover, there is an overlap between both groups, as, for example, inadequate operation may cause an excess of variable load and vice versa. For the purpose of this analysis, we shall accept these inconsistencies and pay particular attention to the second group (b). The main reasons for this are as follows:

- The conventional failures are relatively known and dominate the current engineering practice, while the operational failures – particularly in movable hydraulic structures – are less known and often underestimated, see Refs. [1, 2].
- The conventional failures are relatively 'simple', as there is a direct relation between the strength and stiffness of the structure on the one hand and the probability of failure on the other. Such relations are less direct in operational failures that often result from chains of events. This makes them more complex and more challenging.

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